CHAPTER I
INTRODUCTION

Natural Gas is hydrocarbon formed by the decomposition of vast number of microscopic plants and animals million of years ago. Broken down by heat and the pressure of overlaying rock, these organism were transformed into oil and gas and stored in cavities beneath the surface of the earth.

Natural Gas is a vital component of the world's supply of energy. It is one of the cleanest, safest, and most useful of all energy sources. When natural gas is burned, it gives off a great deal of energy. Unlike other fossil fuels, however, natural gas is clean fuel emitting lower levels of potentially harmful byproducts into the air. Energy is necessary for human to heat our homes, cook our food, and generate our electricity. It is this need for energy that has elevated natural gas is important in our society, and in our lives. Therefore, understanding the availability of supply of natural gas is important because use of this fossil fuel is increase.

Natural gas can be stored in a number of different ways. It is most commonly kept in underground inventory under pressure in three types of facilities. These are: (1) depleted reservoirs in oil and/or gas fields, (2) aquifers, and (3) salt cavern formations. (Several reconditioned mines are also in use as gas storage facilities). Each type has its own physical characteristics (porosity, permeability, retention capability) and economics (site preparation costs, deliverable rates, cycling capability), which govern its suitability to particular applications. Two of the most important characteristics of an underground storage reservoir are its capability to save natural gas for future use and keep the gas withdrawn rate at which from gas inventory.

As stated, the insufficient of natural gas in high demand period can be fulfilled with the stored gas. The rate of gas withdrawal (or gas production rate) from the storage is found to mainly relate with the gas pressure in that storage. Thus, the maximum production rate is limited by the gas pressure and gradually decreases until depletion. This leads to the aim of this work to develop the simulation program that can predict the maximum production rate from the pressure profile in the storage.

Additionally, the program also includes the prediction of gas characteristic in the storage during the withdrawal.

Before the program development, it is necessary to clearly understand about the principle of the underground storage of natural gas. To facilitate the understanding, this thesis is divided into five chapters. The first and second chapters are contributed to the background of the natural gas storage and the problem of the withdrawal of gas from the storage. The literature survey of how to solve this problem is also included.

The third chapter is gathering of the methods to solve the problem, i.e. the partial differential equation theory, the finite different approximation, the implicit alternating-direction method, and the solution of equation resulting from the implicit method. It is found that all of these methods are able to provide the good estimation of the pressure profile and the production rate of the natural gas storage.

The fourth chapter involves with natural gas storage program. The program develops in two dimensional and single layer system from single well to multi-well. For conforming the simulation program, the program is used to simulate the reservoir from PTT EP in carbonate reservoir.

Finally, the thesis is concluded and recommended in chapter 5.The conclusion is about the advantage of this program in this field and the recommendations are the development to the accurate simulation program, which involve the development of three dimensional reservoir and multi-layer system.